

TITLE OF THE INVENTION
MEDICAL X-RAY DIGITIZING AND CHART STORAGE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

N/A

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

N/A

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 This invention relates to electronic processing of X-ray roentgenograms, and more particularly to an electronic process that includes the transference of X-ray roentgenograms to a high resolution digital form that can incorporate patient information, including name and medical record number, and/or bar-coding, that can be printed for inclusion with the patient's office or hospital chart, that can be digitally enhanced to improve diagnoses, and/or
10 that can be stored in a medical computer system for ready retrieval.

2. Description of Related Art

15 In the medical field, patient hospital or office charts presently include only typed or printed reports. X-rays films taken of the patient for diagnostic or other purposes are kept separate from the patient's medical chart. Even in the most efficient hospitals, X-ray films are often misplaced or even lost. In large patient volume emergency room operations, X-ray films may "disappear" and are occasionally never found.

20 Orthopedic Surgeons typically read their own X-ray films. It would be an invaluable aid to their practice to actually see an x-ray picture rather than a verbal or written interpretation that is

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often delayed by as much as 24 to 36 hours before appearing on a hospital record.

5 In providing off hours emergency room (E.R.) coverage, Orthopedic surgeons and other specialists are typically at the mercy of in-experienced resident, or E.R. Physicians, and must often make a decision for emergency care based upon interpretations of x-rays which are frequently inaccurate.

10 The above problems are also encountered in many other areas of medicine including internal medicine, surgical specialties, and radiology.

BRIEF SUMMARY OF THE INVENTION

15 The present invention provides a system for transferring x-ray roentgenograms to a digital format for patient hospital or office records. A high resolution digitizer such as a digital scanner interfaced with computer technology is used to scan each x-ray as it is delivered from the x-ray processor, to encode the x-ray with selected information such as the patient's name and medical record number, and to immediately print a hard paper copy to be included with the patient record. The hard paper copy can
20 be a high resolution plain paper print out. The system can simultaneously store a digital representation of the x-ray picture in a computer readable format for easy access, and/or transmission to another site, at any time. Thousands of x-ray prints can be stored indefinitely on discs, saving vast amounts of storage
25 space.

The applications of the present invention include hospitals and most large physician offices and multi-specialty clinics throughout the United States, and potentially the world. The ability to view an x-ray picture directly as part of the hospital
30 record by utilizing the present invention is a tremendous asset to patient care.

Utilizing the present invention for Orthopedic surgery, x-ray prints could be faxed or electronic mailed (e-mailed) via computer and modem to the physician's home or office to allow the specialist to make a far more accurate interpretation and correct
5 decision for treatment.

In general and pulmonary medicine, chest x-rays and abdominal films would benefit from the present invention and could include the addition of "colorization techniques" to colorize a pulmonary infiltrate or lesion and monitor its progression with treatment.

10 Radiologists utilizing the present invention will be able to give virtually immediate preliminary x-ray reports on all x-rays which typically might not otherwise be read for many hours, possibly delaying critical patient care. Utilizing the present invention, the x-ray image can be faxed or e-mailed directly to
15 the radiologist's home. The radiologist can write a preliminary interpretation and fax or e-mail the report back to the hospital or other source, dramatically enhancing the efficiency of health care to the patient.

Accordingly, it is an object of the present invention to
20 provide a system for transferring x-ray roentgenograms to a high resolution print for inclusion with a patient hospital or office record.

It is another object of the present invention to provide a system for transferring x-ray roentgenograms to computer readable
25 format for storage and/or transmission.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with particular reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

30 Figure 1 is a diagrammatic view of the present invention.

Figure 2 is a diagrammatic view of an alternate embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Fig. 1, a block diagrammatic view of one embodiment of the present invention is illustrated. X-ray processor 2, which can be a conventional x-ray machine, produces x-ray roentgenogram 4. Digitizer 6, which is discussed further hereinbelow, converts x-ray roentgenogram 4 into a computer readable digital format which is read by computer 8. Once the digitized image of x-ray 4 is read by computer 8, the digitized image can be combined with patient data entered via keyboard 10, or via mass storage device 12. The patient data entered can be the patient identification information including name and medical record number. The mass storage device 12 can be one or more conventional disc drives (hard drives, floppy drives, and/or compact discs (CDs)) or other magnetic or other non-volatile storage media as known in the art.

Once the patient data is combined with the digital image of the x-ray, which takes place very quickly, the x-ray and patient identification data can be printed by a high resolution printer 14, and/or displayed by a suitable high resolution monitor 16. The patient identification data will be formatted to be printed with the x-ray image in a preselected location so as not to interfere with interpretation of the x-ray image. A printed x-ray image can then be attached to, and remain with, the patient medical chart.

The x-ray image and patient data can be sent via facsimile 18 and/or e-mail 20 to remote sites. Transmitting the x-ray image in this manner, allows physicians in sites remote from the x-ray machine 2 and actual x-ray roentgenogram 4, to view a high quality x-ray image and improve the ability to made a quick and accurate diagnosis. The e-mail modem 20 further provides the ability to transmit the x-ray image over the Internet so that specialists located anywhere in the world with Internet access can receive a high quality x-ray image. Of course, the quality of the x-ray

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image displayed and/or printed will be partially dependent upon the quality of the hardware at the remote site.

In addition to the x-ray image and patient identification information, the entire patient medical record can be retrieved from storage device 12, and transmitted along with the x-ray image. The physicians located at remote sites can interpret the x-ray image along with the patient medical record, and prepare preliminary reports. The preliminary reports can be faxed 18 or e-mailed 20, back to the site of origin of the x-ray 4. The e-mail modem connection 20 provides the capability of sending preliminary reports over the Internet.

The x-ray image, with affixed patient data, along with the full patient record stored within storage device 12, can be quickly retrieved and printed 14, displayed 16, and/or transmitted by facsimile 18 or e-mail 20 at any time. In addition, the patient medical chart will have a high resolution printed x-ray image that will remain with the chart at all times. The actual x-ray roentgenogram 4 can be stored, but it will no longer be necessary to locate the actual x-ray 4 roentgenogram to view the x-ray image.

X-ray image quality is a function of spatial resolution and definition. Spatial resolution is an objective measure of the ability of a system to resolve high-contrast line pairs on the final x-ray image. Definition is a subjective evaluation of an image based on its overall general appearance which may include factors such as edge sharpness, contrast range, brightness, clarity, and other screen qualities that influence the way an image appears.

Resolution of film and digital images are measured in different ways, and definition is often more important than spatial resolution for interpretation of x-ray images. However, the x-ray film and the digital image produced therefrom must resolve fine detail to be useful in many medical applications.

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Referring to Fig. 2, still another embodiment of the present invention is illustrated. The x-ray processor 2 and digitizer 6 are combined into a single x-ray machine 60 that has as an output, a digital image of the x-ray 4.

- 5 The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

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